Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
Shielding of Electronics Equipment Against Acts of War or Terrorism Involving Hostile Use of Electromagnetic Pulse (EMP)	)	**RM** - 10330
To: Wireless Telecommunications, Common Carrier, and Mass Media Bureaus	)	

COMMENT

This petition, although well meaning, attempts to impose sanctions upon electronic equipment that if allowed, may lessen the currently available telecommunications infrastructure; at least some of which may be called upon to respond in regional or national emergencies. The demanded retrofits or modifications of electrical, electronic and telecommunication systems with unclearly defined and ambiguous systems or devices may result in unavailability or operational compromise of otherwise reliable telecommunications systems.

In the ensuing few paragraphs, I would like to point out as simplistically as possible why the rhetorically enhanced arguments are at least in part without sufficient merit for the actions requested in the instant petition. And, that unless and until sufficient modeling or simulation of the effects of such transient phenomena are completed, reviewed and accepted by competent peer review professional organizations, no mandate for modifications to existing nor to new systems should be promulgated.

1. Petitioners' Description of Pulse Intensity as an Electric Field of 100,000 Volts per Meter.

First off, Maxwell's equations tell us that an electric field, as characterized by the units cited in the instant petition, cannot exist below a conductor. Thus, the phenomenon characterized by the petitioners as an electric field can be stopped by a simple conductive, bonded, electrostatic shield, known commonly as a Faraday cage. The phenomenon, therefore, may be improperly characterized in the instant petition.

One can observe high electric field effects by simply driving a vehicle to a location directly under an AC EHV transmission line, getting out of the vehicle and experiencing the tingling sensation of induced voltage felt when contacting the metal door on the vehicle. And, by sitting inside the vehicle and observing that all such sensations have been eliminated. Also, one can easily observe that the vehicle will start, and all electronics including the radio receiver and electronic ignition will function properly after such an exposure. The magnitude of exposure thus successfully endured will have been close to 100,000 Volts per Meter outside the vehicle and virtually eliminated internally by the thin sheet metal skin of the vehicle. I make this suggestion assuming that the EHV line to ground clearance would have been sufficient to safely position a vehicle and individual under such a line to make this demonstration (ref. ANSI C2).

2. Magnetic Effects Are of Concern.

On the other hand, Maxwell's equations tell us that a transient or time varying magnetic field is a different matter and easily penetrates and is little diminished by good conductors. Conductive foil as suggested in the instant petition is not adequate protection against a strong magnetic field. There are alloys such as Mu metal, which have been shown to provide some limited protection. The proper description for the phenomenon should more accurately have been coined a 'TMP' or transient magnetic pulse which *induces* potentially damaging voltages in devices and systems. And, the phenomenon should described by both magnetic field intensity and pulse duration. The pulse magnitude and its duration must be estimated carefully in order to predict the propagation of the pulse and to provide sufficient information to develop methodologies to mitigate its magnitude.

3. Design and Retrofit Protection Considerations.

Telecommunications equipment should be designed and constructed so as to couple as little extraneous magnetic field energy and resultant induced potential as possible through orientation, shielding, filtering, and transient overvoltage protective devices (arresters). While newly manufactured equipment can incorporate all of the foregoing considerations, in place telecommunications equipment most likely would find proposed solutions to be a combination of transient overvoltage protectors and possibly filter circuitry. Since transient overvoltage protectors are readily available, there are some effects of their application that should be considered.

4. Fail Safe or Fail Unsafe.

The goal of transient overvoltage protection, whether it be on an EHV transmission line, a power substation or distribution transformer, or attached to telecommunication system terminals to reduce induced potential is to 1) prevent damage to the target or zone of protection, and 2) allow continued, uninterrupted operation of protected systems.

Effectiveness of any such protective arrester device depends upon the characteristics of the system component insulation levels, surge impedance and electrical wavelength of the system involved, minimum cutover and clamping voltage of the arrester, arrester withstand energy, and suitability of the arrester for use at telecommunication system frequencies.

Just simply applying a device or devices at antenna terminals or at line terminations will not necessarily guarantee effective overvoltage protection from induced transient overvoltages. And, if the devices succeed in protecting the equipment from damage, they may, in so doing, fail themselves in a manner that disables the telecommunication system being protected.

The energy imparted upon arrester devices must be less than maximum withstand values to avoid their failure in a 'fail unsafe' open circuit mode which may or may not protect the target system from damage. Similarly, by example, 'fail safe', in the case of solid state arresters which short circuit themselves will by their very nature render protected systems unusable until the failed arresters are removed from systems. Incorporation of fuses to automatically decouple failed arresters is sometimes employed to avoid arrester explosion, but may result in incomplete protection by disconnecting failed arresters prior to completion of the pulse.

5. Suggested Commission Action.

Although the petition topic certainly warrants further discussion and investigation, there have been several comments filed thus far which demonstrate that both the American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE) and the International Electrotechnical Commission (IEC) already have published standards and maintain standards-making, expert bodies charged with investigating the effects of such phenomena upon a variety of systems.

In order to ensure fair consideration of all interests, whether they be consumer, manufacturer, user or government, the standards and methodologies for remediation of the effects of such phenomena should be left to ANSI/IEEE and the IEC. Both institutions support forums where the results of studies, experience and investigations can be objectively presented, reviewed and defended so as to avoid the burden of arbitrary standards which are not based upon sound scientific principles.

Respectfully Submitted,

(electronically)

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